NAVAL WAR COLLEGE
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THE COMMAND AND CONTROL DILEMMA OF *JOINT VISION 2010*

by

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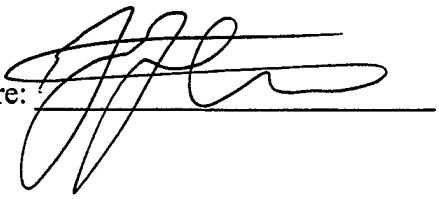
A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements for the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

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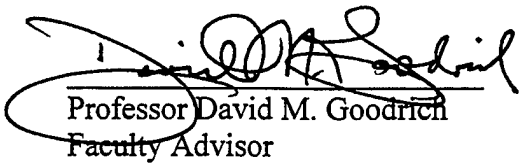

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Abstract

The information superiority that is a centerpiece of *Joint Vision 2010* promises the twenty-first century commander nearly perfect battlespace awareness shared at all the levels of war – tactical, operational, and strategic. Given that commanders at any of these levels may possess the information required to command and control forces, the pertinent question becomes one of who *ought* to do it. Centralized and decentralized command and control processes have both been employed by the military with varying degrees of success in the past, and each has specific advantages and disadvantages for the control of twenty-first century warfare. Synthesis the two approaches, taken together with a clearer understanding of the non-linear nature of warfare, suggests an adaptive command and control process in which all types of command decision-making – informational, operational, and organizational – become part of an iterative decision cycle.

Introduction

The American military continues its rush into the twenty-first century, impelled by the promise of near-perfect battlefield awareness through information superiority. However, the means by which we will exert command and control[1] over future military forces in war remains a topic of healthy debate. Shall we vest more control in the tactical level commander with his broadened access to the operational picture and unprecedented reach and firepower? Or, given the potentially strategic consequences of even minor military operations, shall we harness the power of information systems to centralize control of military forces at the highest command levels?

Joint Vision 2010 is the Joint Chiefs of Staff template for the American military in the next century. Its four operational concepts – dominant maneuver, precision engagement, focused logistics, and full-dimensional protection – are predicated on information superiority and the dominant battlespace awareness it produces. While *Joint Vision 2010* recognizes the need for new means of command and control, it leaves unanswered for now what those means will be, stating that "the optimal balance of centralized and decentralized command and control will have to be carefully developed..."[2] The intent of this paper is to briefly review the origins of our current command and control process, examine the challenges posed to it by twenty-first century warfare, and compare the options of centralized versus decentralized processes in light of these challenges.

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[1] In using the expression "command and control" I will follow Frank M. Snyder in *Command and Control: The Literature and Commentaries* (Washington: National Defense University Publications, 1993), who defines it as "the procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission".

[2] Joint Chiefs of Staff, *Joint Vision 2010* (Washington: 1996), 13-15.

Evolution of the Military Command and Control Process

Human warfare began as an individual endeavor, requiring no more command and control than a signal from eye to brain to identify the target, followed by a signal from brain to the arm directing the violent downswing of the attached club to strike same.[3] However, in order to conduct organized group warfare, humans needed to first develop the means to communicate with one another via language. This engendered the era of what Alvin and Heidi Toffler have called First-Wave warfare,[4] extending from pre-history until sometime in the late eighteenth century. Although usually characterized by its primitive weapons or agrarian armies, First-Wave warfare could be equally well defined by its laboriously slow command and control, primarily by means of direct or relayed verbal orders from a commander who was himself a warrior on the battlefield.[5] Command, as the Roman centurion told Jesus, consisted of little more than, "I tell this one, 'Go' and he goes; and that one, 'Come' and he comes".[6]

As the Industrial Revolution introduced mass production to nations' economies, so it introduced mass destruction as the means of Second-Wave warfare.[7] That this coincided with the switch from oral to written operational command in the century from 1750 to 1850

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[3] Although this describes a relatively simple human action, its underlying complexity is enormous, and we are only now beginning to be able to crudely replicate these command and control processes with machines. For an entertaining description of this process see "Neuroscience for Kids" on the University of Washington Health Education Page, http://weber.u.washington.edu/neuro.html/ (30 April 1999).

[4] First-Wave warfare is seen as the natural adjunct of the agrarian economies which existed from earliest human organization into communities until the Industrial Revolution. See Toffler, Alvin and Heidi, *War and Anti-War* (New York: Warner Books, 1993), 40.

[5] Frederick the Great is the first commander regularly depicted wearing a suit of line rather than a suit of armour. See Martin Van Crevald, *Command in War* (Cambridge MA: Harvard University Press, 1985), 17.

[6] *The Bible* (King James version), Matthew 8:9.

[7] Second-Wave or industrial warfare occurred because the development of the ever more lethal instruments of war coincided with the increased efficiency of industrial economies, which freed up manpower for the *levee en masse* or mass army with which to wield them. See Toffler, *War and Anti-War,* 43-44.

was no accident.[8] Commanders were challenged to exert command and control over forces numbering in the hundreds of thousands and spread across an ever-widening front and ever-lengthening timeframe. Although numerous improvements in communications technology occurred throughout this period, including the telegraph, telephone and radio, they were never able to match the rate of increase in speed and scope of the means of war.[9] The response to this "crisis of control" was the creation, in parallel with the rise of the bureaucracy in the commercial sector, of a hierarchical military command and control structure designed to process and filter information upward while disseminating decisions and orders downward.[10]

Today, just as the Information Revolution is drastically reshaping the way businesses organize and operate, so too must the military redefine the nature of command and control for war in the Information Age. The Tofflers' view of Third-Wave warfare asserts that exploitation of near-perfect knowledge of the enemy (made possible by superior information processing technology) will reduce dependence on ratios of forces and result in "de-massification" of the means of war and de-centralization of warfighting authority.[11] However, others predict that future wars will proceed at speeds beyond the scope of direct human control and be fought by centralized, computerized command and control systems executing pre-determined responses with lightning quickness.[12]

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[8] Van Crevald, *Command in War*, 10.
[9] Ibid., 106.
[10] Just as in war, industrial competition required focusing vast quantities of raw materials, manpower and capital at the decisive point to achieve dominance in a market. As a result, many of nineteenth-century innovations in military command and control paralleled, or were even preceded by, those of the industrial economy. See James R. Beniger's *The Control Revolution,* (Cambridge MA: Harvard University Press, 1986).
[11] Toffler, 83-90.
[12] Arquilla, John and David Ronfeldt, "Cyberwar is Coming" (RAND Study P-7791, 1991), 2.

The Command and Control Challenge of Joint Vision 2010

Undoubtedly one of the key characteristics of future warfare will be an ever-increasing operational tempo that stresses the capabilities of both friendly and enemy forces.[13] The commander's decision cycle – often represented as an iterative four-step process of observation, orientation, decision and action (OODA)[14] – will need to be shortened accordingly, with the advantage accruing to the commander who can operate inside his opponent's decision cycle. In his *War in the Information Age,* General Gordon Sullivan postulates that the decision cycle of tomorrow will require the commander to observe in real time, orient continuously, decide immediately and act within an hour.[15] The information superiority that is the cornerstone of *Joint Vision 2010* promises to provide timely and accurate information about friendly and enemy forces that will greatly facilitate the commander's ability to observe and orient without recourse to the cumbersome information processing and transmitting organizations that were needed by his predecessors. However, new and improved processes for making and implementing decisions also must be developed if the decision cycle is to keep pace with the ever-increasing speed and range of the instruments of war.

Even taking information superiority as a given, each of the new operational concepts of *Joint Vision 2010* still poses vexing command and control problems for the decision-making and action-taking phases of the OODA loop. **Dominant maneuver** requires "forces that are adept at conducting sustained and synchronized operations from dispersed

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[13] Joint Pub 3-0, III-15.
[14] This model of the decision cycle is attributed to COL John R. Boyd, USAF (Ret.).
[15] Sullivan, Gordon R. and John M. Dubnik, "War in the Information Age," Military Review, April 1994, 5.

locations"[16]. Their commander must rapidly decide on the maneuver scheme for forces as diverse as army combat units, air force bombers, and navy ships dispersed across the battlespace and then communicate his decisions effectively to achieve synchronization. **Precision engagement** requires that "our forces locate the target, provide responsive command and control, generate the desired effect, assess our level of success, and retain the flexibility to reengage with precision when required,"[17] necessitating that the commander coordinate assets spread across the increasingly great ranges of our precision strike capabilities. **Focused logistics** will require the ability to "deliver tailored logistics packages and sustainment directly at the strategic, operational and tactical level of operations"[18]. Rather than working from a dedicated if unwieldy logistics tail, tomorrow's commander must draw his logistics support on demand from a variety of military and commercial entities located at great distances from his forces. **Full-dimensional protection**, "the control of the battlespace to ensure our forces can maintain freedom of action during deployment, maneuver and engagement while providing multi-layered defenses for our forces and facilities at all levels,"[19] will increasingly require even the tactical commander to confront an enemy capable of mounting asymmetric strikes from great distances, necessitating the use of theater and strategic level defensive systems.

The most fundamental question that must be resolved is "who should make the decision?" Traditionally this question was almost moot, since only the tactical commander could really "see" what was happening on the battlefield and only the strategic commander near the seat of government could keep attuned to the political policies that drove his military

[16] Joint Chiefs of Staff, *Joint Vision 2010* (Washington, 1996), 20.
[17] Ibid., 21.
[18] Ibid., 22.

options. Just as the Industrial Revolution gave everyone a car, the implied promise of the Information Revolution is that everyone can have access to the same information. The *potential* now exists for an admiral in Washington to pull the trigger for a battlefield weapon, just as a platoon leader in the jungle could directly give the President his assessment of military options. Just because something is possible does not mean it is desirable, but *Joint Vision 2010* gives no clear guidance on exactly *who* should make *what* decisions. The problem is more clearly addressed, but no more clearly answered, in *Expanding Joint Vision 2010: Concepts for Future Operations* which states, "although the potential will exist to centralize the execution of future joint operations, appropriate decentralization will more fully exploit the capabilities of agile organizations and the initiative of leadership at every level."[20] In considering the best way to proceed, it is perhaps useful to consider the extremes of centralized and decentralized control together with examples of how they have been employed in the past.

Centralized Control – Toward a More Perfect Bureaucracy

Pyramidal organizations for the centralization of authority and control grew naturally out of the search for ways to harness the growing power of labor and capital into productive effort. Centralized organizations allocate the right to make decisions in one of two ways: autocratically, in which all decisions are made at the top level, or bureaucratically, in which decisions are made at pre-determined lower levels in accordance with narrowly defined policies.[21] Through necessity it is the latter form into which most large organizations, including the military, have fallen. However, with the reduced need for the information

[19] Ibid., 24.

processing and filtering functions of the bureaucracy, it is the autocratic form of centralized control which may prove most tempting to the future commander possessed of near perfect battlespace awareness and instantaneous control over his forces.

When the United States government first grappled with the question of appropriate command and control for nuclear weapons, it was confronted with a weapon so powerful that the decision to use it could only be vested at the highest level of government.[22] Mutual deterrence was based on a bedrock assumption of rational decision-making by the heads of state of the two superpowers, and consequently their fingers had to be the ones on the nuclear trigger.[23] Yet the forces that would execute the order were dispersed over thousands of square miles of prairie and ocean and could be expected to be under attack as the decision to use them was being made. The result was the creation of a system which clearly illustrates three key elements of any command and control system – first, an early warning net designed to funnel indications of imminent nuclear attack to the President; second, a set of preplanned courses of action based on a limited number of foreseeable situations; and finally, a robust communications network intended to reliably transmit launch orders directly to the strategic bomber and missile forces. That this highly centralized and autocratic command and control system for nuclear war-fighting remains unused may be the best testament to its effectiveness.

However appropriate centralized control might be for nuclear weapons, in the prevailing view it has been less effective when applied to conventional forces. In Vietnam,

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[20] Joint Chiefs of Staff, *Expanding Joint Vision 2010: Concepts for Future Operations* (Washington, 1997), 68.
[21] Hall, Richard H., *Organizations: Structure and Process* (Prentice-Hall: Englewood Cliffs, NJ, 1977), 182.
[22] Harry Truman told his Secretary of Defense, James Forrestal, that he did not want "to have some dashing lieutenant colonel decide when would be the proper time to drop an atomic bomb". See Daniel Ford, *The Button* (Simon and Schuster: New York, 1985), 34.

President Lyndon Johnson and his lieutenants in Washington were able to employ elements of the very same command and control system developed for nuclear bombers to directly control the selection and bombing of targets in North Vietnam. This action, although it represented a significant technological achievement, has been widely criticized for limiting the effectiveness of the air campaign in that unfortunate war.[24] However, when the CINC invoked a similar centralized approach to targeting in Bosnia some thirty years later it was hailed as "appropriate to the immediate task of keeping the air campaign politically viable," although tactical commanders still chafed under the restrictions. [25]

Perhaps not surprisingly, in light of its coming of age in the era of radio communications, its long association with strategic command and control, and the global reach of its weapons systems, it is the Air Force which most closely espouses the centralized view of command and control for the twenty-first century. The current Joint Force Air Component Commander, with his monolithic Air Tasking Order, in some ways epitomizes the industrial war approach to centralized command and control.[26] The Air Force's future Battle Management Command and Control system is designed to enable the Joint Force Commander "real-time control and execution of all air and space missions," and in the long term it envisions the migration of many of its manned aircraft missions to centrally controlled Unmanned Aerial Vehicles.[27]

Proponents of centralized control argue that it alone provides for the critical "unity of command" and the ability to effectively employ and deconflict diverse forces acting in

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[23] Blair, Bruce G., *Strategic Command and Control* (The Brookings Institute: Washington, 1985), 14.
[24] Clodfelter, Mark, *The Limits of Airpower* (The Free Press: New York, 1989), 118-119.
[25] Owen, Robert C., "The Balkans Air Campaign Study: Part 2," *Airpower Journal,* Fall 1997, 9-10.
[26] Roman, Gregory A., *The Command or Control Dilemma: When Technology and Organizational Orientation Collide* (Air University Press: Maxwell AFB, AL, 1997), 24.

concert across the battlefield.[28] With the capabilities of future information systems to provide improved battlespace awareness, the central commander can assimilate the operational situation while monitoring and controlling individual tactical units, even at a great distance. Improved automated predictive tools and decision aids could enable him, with the support of his joint staff, to respond to battlefield events in real-time, and optimally employ and coordinate joint forces that might themselves be spread across thousands of miles.

A second argument for centralized control focuses on the changing role of warfare in the post-Cold War world. With the diminishing likelihood of all-out global war, the use of armed force has become far more common as a direct extension of the political process, and thus more subject to detailed control exerted by elements outside the military. With the ever-increasing range and lethality of our conventional munitions, even their operational and tactical employment becomes imbued with strategic-level political implications, much as with nuclear weapons. A centralized approach to command and control may be required, it is then argued, to ensure they are used in keeping with our political objectives.

A third reason for centralized control lies with the still-dominant service culture orientation of our armed forces. While the services acknowledge the benefits of jointness, implementation of joint initiatives has been slow to take root, and to date the only operational commands where fully joint staffs work side-by-side every day are the unified CINC's. Joint Task Force commanders must usually assemble an *ad hoc* staff and may not be fully capable of employing the spectrum of forces available, while at the same time suffering from

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[27] Department of the Air Force, *Global Engagement: A Vision for the 21st Century Air Force* (Washington 1997), 14.

generally inferior lashed-together communications systems and the inevitable friction of unfamiliarity. Rather than create another entire level of hierarchy – the Standing Joint Task Force, complete with its own service components – one can argue that it is better to simply capitalize on the already existing capabilities and jointness of the CINC staff and centralize control of forces at that level.

Detractors of centralized decision-making argue with almost religious fervor that centralized control strips the tactical leader of the autonomy and initiative necessary to combat the uncertainty of war. Van Creveld argues that, "historically speaking, those armies have been most successful which did not turn their troops into automatons, did not attempt to control everything from the top and allowed subordinate commanders substantial latitude."[29] In seeking to avoid von Moltke's "most unfortunate commander...one with a telegraph wire attached to his back,"[30] advocates of decentralized decision-making prefer to provide the junior leader with the commander's intent but leave open the details of execution. This view, however, risks applying yesterday's lessons to tomorrow's war, since historically there were few options available for effective centralized control by a commander. Today's revolution in information systems promises the future commander better situational awareness in his office than he had as a front-line platoon leader had twenty years ago, and centralized decision-making may prove to be far more viable as a warfighting tool when unshackled from the ponderous communications systems of yesteryear.

A second criticism of centralized decision-making is that it risks overloading the commander. As Van Creveld states "the paradox is that, though nothing is more important in

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[28] Barnett, Jeffrey R., *Future War: An Assessment of Aerospace Campaigns in 2010* (Air University Press: Maxwell AFB, AL, 1996), 33.
[29] Van Creveld, *Command in War,* 270.

war than unity of command, it is impossible for one man to know everything."[31] While advances in information gathering have made the promise of real-time battlespace awareness very achievable, progress in artificial intelligence and decision support technology has lagged behind. The decide-act phases of the decision making loop are thus still inextricably tied to the limitations of the human brain.

Decentralized Control – Autonomous Warfighting

If the brain's control of movements of the human body via the central nervous system is a good example of centralized control, then the body's response to an infection is equally illustrative as an example of decentralized control. A wandering white blood cell or macrophage encounters a virus and digests it, after which it displays characteristic identifiers of the virus, called antigens, on its surface. Nearby helper T-cells, stimulated by the antigen, begin to produce chemicals that allow intercellular communication, directing production of killer-T cells (to kill infected host cells in the body) and antibody producing B-cells (which bind up any remaining viruses. Finally, suppressor T-cells are produced which direct the system to return to its "peaceful" state once the infection is suppressed, all without recourse to the brain and central nervous system.[32]

In military terms, this decentralized control process is analogous to a tactical commander receiving sensor information about an enemy, applying some predetermined rule set – including such things as what constituted an enemy target, his higher commander's overall objective, and the means he was authorized to employ – and then taking appropriate

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[30] Hughes, Daniel J., ed., *Moltke and the Art of War: Selected Writings* (Presidio Press: Novato CA, 1993), 77.
[31] Van Creveld, Martin, *The Transformation of War* (The Free Press: New York, 1991), 109.
[32] For a more thorough presentation of this process see "The Immune Response: The Body's Natural Defense" of the Cancer Research Institute Page, <http://www.cancerresearch.org/immresp.html/> (30 April 1999).

action. At the tactical level, at least, history provides several examples of such successfully self-organizing military units. Perhaps the earliest was the Roman legion, organized on the field into a checkerboard of centuries, each able to view several others and thus come to their aid without command from above.[33] The success of Napoleon's *Grande Armée* was due primarily to his ability to release the bulk of his forces from under his own direct tactical command and organize them into self-contained, mission-oriented units, each with its own commander and staff.[34] At Trafalgar, when events developed rather differently than Admiral Lord Nelson had planned, he could be confident that his commanders, well versed in his thoughts on tactics from their frequent conversations with him, would take the right actions.[35]

The Navy has traditionally favored mission-type orders, such as those that sent its captains roaming the seas for years at a time as plenipotentiaries without communication from home. Although long range communications have long since obviated the need for such missions, the image of the dashing and independent naval commander dies hard. It is perhaps not surprising then, that the Navy espouses a self-organizing approach to command and control for the 21st century with its Network Centric Warfare (NCW) concept. In the operational architecture of NCW, a high-fidelity sensor grid (sensors) is networked to a precision engagement grid (shooters) via a high-quality information backplane, with the goal of providing dominant battelespace awareness to all players simultaneously.[36] In this it resembles the information superiority goals that stimulate most of the *Joint Vision 2010* operational concepts. However, in making the decision as to which targets to engage with

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[33] Van Creveld, *Command in War,* 45.
[34] Ibid, 98.
[35] Palmer, Michael A., "Lord Nelson: Master of Command," *Naval War College Review,* Winter 1998, 109.
[36] Cebrowski, Arthur K. and John J. Garstka, "Network-Centric Warfare: Its Origin and Future," *U.S. Naval Institute Proceedings,* January 1998, 32.

which weapons, NCW turns its back on centralized control and instead seeks to shorten the decision cycle and lock out enemy options through speed of command and self-synchronization at the tactical level. Self-synchronization postulates that a bottom-up organization will be better able to deal with complex military operations of the future, coordinating horizontally to achieve mass across time and space without the delays of command from above.[37]

Proponents of Network-Centric Warfare invoke Metcalfe's Law, which states that the computing power of a network is proportional to the square of the nodes, as a basis for achieving a concomitant increase in combat power for networked military forces. For the command and control aspects of NCW, one can envision automated decision aids pairing targets and weapons, designing maneuvers to improve force distribution, and automatically calling for reload and replenishment of depleted units. In essence, NCW is an effort to tie together the elements of joint forces to create power without having to create the entire joint command and control hierarchy otherwise needed to employ it.

One criticism of the self-synchronizing concept of NCW is that, as illustrated above, self-synchronization has heretofore only been achieved at the tactical level, where forces are "in sight" of one another with a common tactical picture. In addition, the friendly and enemy forces all had similar unit values and forces at one point of the battlefield could not reasonably and quickly be employed at another point very far distant from the first. What happens to this picture in the asymmetric world of tomorrow when a limited number of weapons or forces that may exert decisive effects anywhere must be prioritized across an entire theater. Perhaps the common operational picture that emerges from information

[37] Ibid, 33.

superiority will enable forces to self-synchronize on the operational level as well, but this is certainly still subject to debate. In addition, examples of self-organizing systems in the business world are guided by a common and straightforward motivation for profit and can generally be guided by a simple rule set, whereas the objectives in tomorrow's military operations will likely be manifold and complex, requiring equally complex and as-yet undetermined rules.

A second concern for Network-Centric Warfare is the underlying assumption that, given the same information, the bottom level commander will make an equally good or better decision as his higher level counterpart. Van Creveld asserts that command is always a balance of two questions – how to fight the enemy and how to survive in the field – and that the tactical commander is primarily and justifiably concerned mostly with the latter.[38] The implied pressure for speed in decision-making would also seem to argue against good decisions. Indeed, one commentator suggests that we use the additional time provided by improved processing and distribution of data to increase our "analysis and contemplation of appropriate response" instead of a "knee-jerk ratcheting down of response time."[39]

Adaptive Control – A New Option

Even from the oversimplified discussions above, it is apparent that no single approach to command and control can answer all the demands that will be placed upon commanders in the next century. One author, for instance, suggests that centralized control may be most appropriate for precision strike while decentralized control is required for dominant

[38] Van Creveld, *Command in War,* 56-57.
[39] Barnett, Thomas P.M., "The Seven Deadly Sins of Network-Centric Warfare," *U.S. Naval Institute Proceedings,* January 1999, 37.

maneuver.[40] The conflicting demands of increased speed of decision-making and increased political control over warfighting will inevitably force some compromises to take place.

However, many of the problems discussed for both centralized and decentralized control stem from our continued inability to appreciate the truly non-linear nature of war. In the Newtonian or linear view of the world, causes have predictable effects and application of a force will result in a proportional response. Hierarchical control structures are based upon this deterministic worldview, in which decisions made at a given level will have predictable effects confined primarily at or near that level. However, a non-linear view of the world understands that perturbations at the smallest scale can cause sudden, unexpected and apparently chaotic results at the largest scales in a short period of time[41].

The traditional military approach to the uncertainty caused by this non-linearity is to label it the "friction of war,"[42] and then apply enough force excess to ensure a near-linear response, since even a highly non-linear system can be forced into predictable behavior by adding enough damping. Today, however, the cost of creating such overwhelming mass is becoming unsustainable, especially in the face of an information revolution that can greatly amplify the perturbating factors of warfare. The real key to dealing with a non-linear world will be the development of an adaptive command and control structure which, instead of drawing rigid boundaries and lines of control, continuously evolves and adapts to the process of warfare it is trying to control.

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[40] Cone, Robert W., "Command and Control in Joint Vision 2010: Micro-management or Decision Exploitation?" (Unpublished Research Paper: U.S. Naval War College, 1998), 11-12.
[41] Gleick, James, *Chaos: Making a New Science* (Viking: New York, 1987), 23.
[42] Clausewitz, Carl von, *On War,* edited and translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 119-121. Interestingly, Clausewitz was borrowing this term from the physicists of his day who were likewise unable to mathematically describe the non-linear effects of friction on bodies in motion.

Adaptive command and control requires first that we discard our deterministic view of warfare and with it the division between the processes of planning and executing. Just as prediction of the weather requires vast and iterative computation, so too will the control of warfare require iterative decision cycles at all levels. No longer will we be able to decide first at the strategic level, then at the operational and then at the tactical levels, since our improved understanding of the non-linear processes of war tell us that these levels cannot be viewed independently. Instead, all levels will have to draw information from the common picture, decide and act at the appropriate scale based on common objectives, and observe and react to the results in moving to the next cycle.

Decisions will be characterized not so much by who makes them but by the type of decision-making required, which Snyder defines as informational, operational and organizational.[43] Informational decisions are those associated with deciding what is actually happening – in these cases to understand is to decide. Operational decisions are of the "if-then" variety, such as the decision to maneuver one's forces in order to take advantage of a perceived enemy vulnerability. Organizational decisions are the most complex, and are the result of encountering a situation that the commander cannot respond to adequately with the existing structure, such as a crisis that requires the creation of a new task force. In current command and control systems, informational decision-making is being rapidly accelerated by the improvement of information systems. Operational decision-making proceeds more slowly and on a piecemeal basis via written and verbal orders. Organizational decision-making is virtually frozen in the stasis of the organizational chart that graces every OPLAN. To achieve the promise of adaptive command and control, all types of decision-making must

[43] Snyder, 15-16.

move to an iterative process. The changing operational intentions of the various commanders must be depicted as clearly as the disposition of enemy forces, and organizations must be able to be created and reformed in response to changing conditions and threats. This will require not only new information systems, but also new ways of communicating decisions and the ability to quickly link together forces by virtual bonds as strong as today's hierarchical command structure.

Conclusions

In looking at the challenges for command and control in the twenty-first century, it is evident that the promise of information superiority is a double-edged sword. Just as computers provided the means to dominate the population in George Orwell's *1984*, so to do they provide the means for centralizing control of military forces in ways that could make the political interference of Vietnam look like minor tinkering. On the other hand, throwing forces into combat with nothing more than a common operational picture and expecting them to self-synchronize is like expecting to get a soufflé from tossing eggs and flour into the oven. Rather than maintaining the hierarchical levels of war as the basis for our decision-making, we need to evolve to an adaptive command and control process that recognizes the continuous interaction of all levels. Our organizational decision-making must become as agile as our informational decision-making, and both must be tied to an iterative vice deterministic planning process that recognizes the messy non-linear nature of war.

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